been the author himself. However, a few points may be mentioned. In discussing the bisectors of the angles between lines or between planes, the only method derived is valueless if one of the boundaries of the angle passes through the origin. Incidentally, does any book treat this subject properly? The whole discussion of positive and negative regions, so well done for curves, is hardly convincing when applied to lines and to planes. A considerable number of the later proofs are not complete, and in some cases rather too brief to be of great service, yet with proper skill on the part of the instructor may have influence in the right direction.

In those institutions in which advanced algebra is required for entrance, the book would either have to be abbreviated, or a number of topics repeated. Perhaps it is an argument to allow more alternatives for entrance, and make frank provision for teaching algebra to all in college.

VIRGIL SNYDER.

PROBLEMS AND SOLUTIONS.

B. F. FINKEL, CHAIRMAN OF THE COMMITTEE.

PROBLEMS FOR SOLUTION.

Special Notice.—Please reread the requests as to form of solutions on pp. 258–259 of the October 1913 issue. Unless these directions are observed by contributors, solutions must either be entirely rewritten by the committee or else rejected. Put all drawings on separate sheets.

MANAGING EDITOR.

ALGEBRA.

When this issue was made up no solutions had been received for numbers 401, 402, 404, and 406. Please give attention to these.

405. Proposed by E. J. MOULTON, Northwestern University.

Given the alternating series

$$s = 1 - 1/2 + 1/3 - 1/4 + 1/5 - \cdots.$$

(*a*) Let s_n be the sum of the first n terms of the series. Show that in order to make the difference $s - s_n$ numerically less than $1/2k$ (k a positive integer) it is necessary and sufficient to take $n = k$; hence s_{500} differs from s by less than .001. (*b*) Let s_n' be the sum of s_n and 1/2 the $(n + 1)$th term of the series. Show that the difference $s - s_n'$ is numerically less than $1/2n(n + 1)$; hence s_{22}' differs from s by less than .001.

406. Proposed by S. A. COREY, Hiteman, Iowa.

Solve the system of equations:

$$\begin{aligned}(1 - x)(a_1 + a_2y + a_3z) &= d,\\ (1 - y)(b_1 + b_2x + b_3z) &= g,\\ (1 - z)(c_1 + c_2x + c_{3y}) &= h.\end{aligned}$$

407. Proposed by E. B. ESCOTT, University of Michigan.

In computing the values of the natural logarithms of 2, 3, and 5 by the following formulas:

$$\begin{aligned}\log 2 &= 2(7P + 5Q + 3R),\\ \log 3 &= 2(11P + 8Q + 5R),\\ \log 5 &= 2(16P + 12Q + 7R),\end{aligned}$$

where P, Q, and R are numbers which were computed by infinite series (G. Chrystal, *Algebra*, Part II, chapt. 28), it is found, on comparing the results with the known values of these logarithms to 15 decimals, that there are the following errors: $-2,533$, $-4,052$, and $6,080$, respectively. Find the errors in P, Q and R.

GEOMETRY.

When this issue was made up no solutions had been received for numbers 410, 417, 421, and 427. Please give attention to these.

434. Proposed by CLIFFORD N. MILLS, Bloomington, Ind.

ABC is any triangle with sides a, b, c. Prove by purely geometrical methods that the area $A = \sqrt{s(s-a)(s-b)(s-c)}$, where $s = 1/2(a+b+c)$. (From Olney's *Geometry*, page 255, with slightly simplified notation.)

435. Proposed by R. M. MATHEWS, Riverside, California.

From a fixed point A perpendiculars are dropped to the tangents drawn to a circle whose center is O. Prove that the locus of the feet of the perpendiculars is a limaçon.

436. Proposed by A. J. KEMPNER, University of Illinois.

Given in a plane two similar curves arbitrarily situated, except that they shall possess the same sense of direction (which, of course, does not mean that they are similarly located). Let corresponding points on both curves be joined by straight lines, and let all of these straight lines be divided in the same ratio $\lambda : 1$, λ being any real number. Prove that the points of division all lie on a curve similar to the two given curves except when they all happen to fall together.

CALCULUS.

When this issue was made up no solutions had been received for numbers 335, 337 to 340, 342, 348, and 350. Please give attention to these.

356. Proposed by B. F. FINKEL, Drury College.

A steel girder l feet long and w feet wide is moved on rollers along a passageway a feet wide and into a corridor at right angles to the passageway. How wide must the corridor be to just admit the girder?

357. Proposed by W. D. CAIRNS, Oberlin College.

A continuous variable represented by a point on a vertical line changes according to such a law that it is reduced to $1/m$ of its value on being moved a units upward, irrespective of the special position from which it is moved. Find the law of change, that is, the relation between the variable y and the height h of the variable point above a fixed point of the vertical line.

358. Proposed by C. N. SCHMALL, New York City.

About a given circle circumscribe the smallest parabola.

MECHANICS.

When this issue was made up no solutions had been received for numbers 271 to 275 inclusive, and 277 to 279 inclusive. Also 268 and 269, proposed in 1912, have not been solved. Please give attention to these.

288. Proposed by C. E. HORNE, Westminster College, Colorado.

Show that the tangential velocity of a projectile at any point of its path is equal to the velocity it would have acquired in falling, under the influence of gravitation alone, from the directrix to the point in question (Hulburt's *Calculus*, p. 220, ex. 10).

289. Proposed by C. N. SCHMALL, New York City.

A particle of elasticity e is projected with a velocity v at an angle of elevation ϕ from a point on a smooth horizontal plane. Show that after $2v \sin \phi/g(1-e)$ seconds, it will cease to rebound and will move along the plane with a uniform velocity $v \cos \phi$.